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BEAN DISEASES IN WESTERN UNITED STATES IN 1929

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During the summer of 1929, the writer made a field study of the diseases of bean (Phaseolus vulgaris) in the important seed-producing states of the semi-arid west. A brief report of these findings is given, not only recording the diseases found in the several regions, but also reporting the absence of certain diseases in a particular locality.

The survey included examination of fields in the following states: Colorado, Utah, Wyoming, Montana, Idaho, and California. The survey did not include all portions of those states, but only those sections where the bean growing industry is of importance. Because of the excellent cooperation by the seedsmen in all of the localities visited, it was possible to inspect a representative number of fields in each region and it is believed that the report gives a reliable picture of the bean disease problems in the sections visited during the past summer.

COLORADO

The survey was limited to Weld and Morgan Counties, where several seed companies maintain large acreages of garden beans. Examination of fields was made during June, July, and the first part of August. A total of 64 plantings were examined.

Bacterial blight (Bacterium phaseoli or B. medicaginis var. phaseolicola). The disease was observed to a very limited extent. It occurred in 12 fields and was serious in only a few instances. In practically every case, seed infection was responsible for the initial appearance of the disease which was observed on the young seedlings at the cotyledonary node and as a systemic infection. The infected seedlings usually died and because of the prolonged dry weather resulting in a greatly reduced dissemination, little or no secondary infection resulted. In a few instances, the plants did not die until the time

of pod formation, and in such cases a symptom known as stem girdle could be observed at the cotyledonary node, indicating that the infection originated from the seed.

In an isolated region, one case of secondary blight spread was observed, causing a reduction in yield of from 10 to 15 per cent of the crop. The seed which was planted carried a slight amount of infection. On July 3 a local rainstorm prevailed and the splashing of water and whipping of leaves by wind accounted for the bacterial spread.

Wherever the systemic blight was found, the seed used had been grown in Colorado in 1928. It will be recalled that in 1928 serious losses resulted to the bean crop because of this disease. Since most of the Refugee varieties were home grown, it was in fields grown with these varieties where practically all of the infection was observed. It should be understood that, since most if not all of the primary infected plants died before pod formation with little or no secondary spread taking place, the remaining plantings in this section of Colorado were very free from bacterial infection.

Anthracnose (Colletotrichum lindemuthianum). Anthracnose was not observed in any of the fields examined. In trial bean plantings at Greeley where infected seed was planted, the disease failed to appear. Because of the sensitivity of this organism to high temperatures and low humidities, conditions which prevail in Colorado during the growing season, the organism failed to develop. This disease has not been reported from this state in the past ten years even though eastern-grown seed, which without doubt has carried the organism, has been planted from year to year.

Mosaic (virus). This malady appeared to be more widespread in 1929 than in 1928. In the 26 fields of the Refugee varieties, which are very susceptible to this malady and are grown more extensively in Colorado than in any of the other intermountain states examined, an average of 15 per cent mosaic was recorded. In comparing fields planted from eastern-grown seed in 1928 as compared with Colorado grown seed, it was observed that the former carried less infection, averaging 1/2 to 3 per cent, whereas the latter carried on an average about 20 per cent.

In fields of Pinto beans, the percentage of mosaic varied from 3 to 30 per cent, averaging about 18 to 20 per cent, causing in some cases a decided stunting of the plants. On most of the garden varieties excepting the Refugees, mosaic ranged from 1/2 to 3 per cent causing no loss in yield.

Root rots (Fusarium sp. and Rhizoctonia). Root rots did not appear to cause any appreciable loss in the plantings examined, although in all fields plants could be found infected with one or the other of these rots, but only in four fields were they widespread. In one field of Pinto beans, practically 60 per cent of the seedlings were infected, but since dry weather followed, new secondary roots were formed so that little damage resulted.

In a small planting of Giant Stringless Green Pod, the Fusarium wilt was observed causing the death of about 5 per cent of the crop. The infection above ground was noted at the time of pod formation, the plants being killed in a comparatively short ime.

Rust (Uromyces appendiculatus). In 1927 bean rust destroyed large acreages of Pinto beans in Weld County, however, it failed to cause any appreciable loss in 1929. Due to the prolonged dry weather, the first infection was not noted until August 7, one week after the first rainfall of the summer. The

amount of infection was very small, not nearly large enough to cause an epidemic even though the weather conditions had been favorable for spread and development.

UTAH

The sections surveyed in Utah were in Weber and Box Elder Counties. Thirty-two fields consisting mostly of garden varieties were examined.

Bacterial blights. Very little bacterial blight was observed in the fields visited. In a few cases, leaf lesions could be found, but not the stem girdle which was found in Colorado and which was likewise reported by Linford to have been quite serious in 1928 in Utah.

Anthracnose. This disease was not recorded in any of the crops examined.

Mosaic. In fields planted to the Refugee varieties, mosaic was particularly noted. The average percentage of disease was from 20 to 25 per cent, causing a slight reduction in yield, depending upon the severity of the infection. In plantings of other garden varieties, 1 to 3 per cent disease was observed, causing no damage.

Non-parasitic chlorosis. It was noted in numerous instances that where beans were planted on land that had been cropped by sugar beets for a number of years, the stands in every case were very poor. The plants in such cases were decidedly stunted and chlorotic. In some instances, a 50 per cent reduction in yield resulted. It is an established fact that sugar beets are heavy feeders on phosphorus and after a period of from four to five years of cropping deplete the soil of this element. It has likewise been found that beans readily respond to a fertilizer high in phosphorus and it is possible that the chlorosis noted may have been due to phosphorus depletion of the soil.

WYOMING

The survey in this state was conducted in Big Horn and Washakie Counties. Both garden and field beans were examined but more attention was paid to the former than the latter. The total number of plantings observed was 34.

Bacterial blights. In all of the fields observed, blight was found to a limited extent in three fields causing very slight damage. In only a single field was infection noted on the pods. Because of high temperatures and low humidities, the disease failed to spread and develop as it had done in 1928 when heavy losses were experienced in many of the plantings. As in Colorado, diseased seedlings died resulting in no secondary spread.

Anthracnose. This disease was not observed.

Mosaic. The widespread abundance of the virus was about equal to that noted in Colorado, infection varying from 20 to 25 per cent in the Refugee varieties. The infection in most cases was severest in fields which were allowed to grow to weeds and also along the edges of the field, either close to a fence row or to an irrigation ditch where weeds were allowed to grow. In the center of the fields, less disease was observed.

Root rots. The Fusarium root rot was found to be of serious consequence in one field where the reduction in stand was from 5 to 10 per cent. The soil of this field was heavy and poorly drained, conditions very favorable for the development of root troubles.

Alkali injury. Alkali injury was noted in two fields, causing a slight reduction in stand. This condition was found where the drainage was poor.

MONTANA

The regions surveyed in Montana were in Carbon and Yellowstone Counties where 34 fields were examined.

Bacterial blights. More bacterial blight infection was recorded in Montana than in any other region surveyed in the west. Thirteen fields, or 38 per cent, contained blight infection ranging, except in a few instances, from 2 to 5 per cent, causing little appreciable damage. In two fields, one planted to Refugee Wax, the seed for which was eastern grown in 1928, and the other to Full Measure of unknown source, bacterial blight was quite serious, and since most of the infection was noted on the pods, the reduction in yield was estimated to be from 25 to 35 per cent.

Anthracnose. Not observed in any of the plantings.

Mosaic. In all fields of Refugee and Great Northern varieties mosaic was observed, infection varying from 10 to 25 per cent. From 1 to 3 per cent was noted on most of the other varieties planted.

Root rots. Fusarium wilt was observed in a single planting of Giant Stringless Green Pod causing about 2 per cent reduction in stand. The plants did not show symptoms typical of those produced by Fusarium martii phaseoli until they were well podded. The field had been flooded earlier in the season possibly accounting for the development of the disease.

IDAHO

The section surveyed was in the southern part of the state, principally in Twin Falls County. This region is possibly the largest bean producing section in the intermountain states, approximating 88,000 acres during the past year. The principal variety grown is the Great Northern, very susceptible to mosaic.

Bacterial blights. No blight was observed in any of the plantings visited. Even though diseased seed was planted in trial grounds located at Twin Falls, very few seedlings showed the initial symptoms. These few infected plants probably died since no sign of disease could be observed when the crop reached maturity. Because of the high temperatures and low humidities which prevail throughout the growing season, the disease did not develop and spread. As far as the writer can ascertain, bacterial blight has never been reported from the southern Idaho section.

Anthracnose. The disease was not found in any of the fields examined.

Mosaic. This virus trouble was very widespread, as it has been in the past few years, but less plant stunting was observed in 1929 than in 1928. In all commercial fields of Great Northern beans, mosaic was found in percentages varying from 25 to 70. Diseased plants were found in larger numbers along the edges of fields than in the centers. Practically all of the Refugee varieties planted in the trial grounds showed from 95 to 100 per cent infection, resulting in severe stunting of the plants in some cases.

Root rots. These diseases were found sparingly and were of little consequence, and caused no appreciable damage.

Curly top (virus). Curly top was observed early in the season causing in general not more than a 2 to 3 per cent reduction in stand. In certain fields of Great Northern beans grown in close proximity to the desert land, as high as 20 per cent reductions in stand were noted.

CALIFORNIA

The regions surveyed in California were in Sacramento, Santa Clara, San Joaquin, Monterey, and Ventura Counties. Since time did not permit as detailed a survey as was conducted in the intermountain states, fewer fields were examined. Because of this, the observations here recorded may not represent a complete picture of the diseased condition of the bean crop as it appeared in 1929.

Bacterial blights and anthracnose. Not observed in any of the fields examined.

Mosaic. In certain fields of Refugee beans grown in the Sacramento, San Jose, and Salinas districts, mosaic was seen, although it did not produce the decided stunting which is often noticeable on beans grown in the intermountain states. The region which appeared most free from this malady was the section in the vicinity of Thornton (San Joaquin County) where little or no secondary spread was observed. Very little infection was noted on field beans grown in the Sacramento and Thornton regions.

Root rots. The root rots are possibly more widespread in California than in any of the other western bean growing states. Fusarium sp. and Rhizoctonia were found to be very prevalent in a number of fields of California Pinks, a field-bean variety, causing great reductions in stand and yield. Likewise a 10 per cent decrease in stand was observed in a large planting of Henderson Bush Lima beans grown in the Sacramento region. In the vicinity of San Jose, Fusarium root rot was observed in a planting of Late Stringless Refugee beans but causing little damage to the crop. In the Salinas section, the root troubles, caused principally by the Fusarium sp., were found causing little damage on practically all varieties of bush beans.

Intercropping of beans appeared to be a common cultural practice particularly in the Sacramento section. In many of the fields examined, beans were intercropped with asparagus which required a high water table. Such a water level, ideal for asparagus, was apparently unsuited for beans since a high

percentage of root rots was always observed in such fields and less infection was found where the water was held at a lower level. With a high water table the soil remains wet for long periods of time, accounting possibly for the widespread prevalence of root troubles.

Sunscald (Non-parasitic). In plantings at Salinas, a large amount of the distinctive reddish discoloration could be seen on the pods and leaves. This trouble was attributed to intense sunlight which followed periods of high humidity produced by the fogs.

Insect injuries. Injuries caused by the feeding of red spiders and thrips were observed causing serious stunting and a decided reduction in yield in a number of fields of Refugee beans near Sacramento.

SUMMARY OF 1929 CONDITIONS

Bacterial blight was not found in Idaho and California; sparingly in Wyoming, Utah, and Colorado; and slightly more abundant in Montana.

Anthracnose was not observed in any of these states in commercial acreages nor even where diseased seed was planted in trial grounds in Colorado and Idaho.

Mosaic was distinctly more widespread than any of the other bean diseases. It was very prevalent in Southern Idaho, but less widespread in Colorado, Utah, Wyoming, Montana, and California. It appeared to be more abundant in Colorado in 1929 than in 1928.

The root rots, although found in all of the western states which were surveyed, were more abundant in California. The variation in cultural practices in certain regions of that state from those used in the intermountain regions may be partly responsible for this condition.

Curly top of beans was only observed in Southern Idaho, where in general the disease was of minor importance. Plantings located in close proximity to the desert were in some cases severely damaged.

Rust was found in Colorado, but was of minor significance, causing no reduction in yield. Because of the prolonged dry weather which prevailed during the growing season, the organism failed to develop and spread.

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